Human Effectiveness Directorate

Training Needs Assessment and Knowledge Engineering for Space Operations

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What Is Space Operations?

- **Space surveillance**
- **Missile Warning ground stations**
- **Satellite tracking/control**
- **ICBM launch control**
- **Launch oversight**
- **Theater space support**
- **Space Forces C2**

Unique data and consoles in same facility lead to significant OJT requirements

Background

- AFSPC needs Mission Ready (MR) operators

- No clear definition of "MR" across systems

- Diversity of systems/missions has limited common solutions to operational problems

- Cognitive readiness of operators is suspect

- OJT to reach MR significant

- Operational equipment used for training

- AFRL/HEA developing next generation training methods and tools

- AFSPC/DO requested HEA expertise
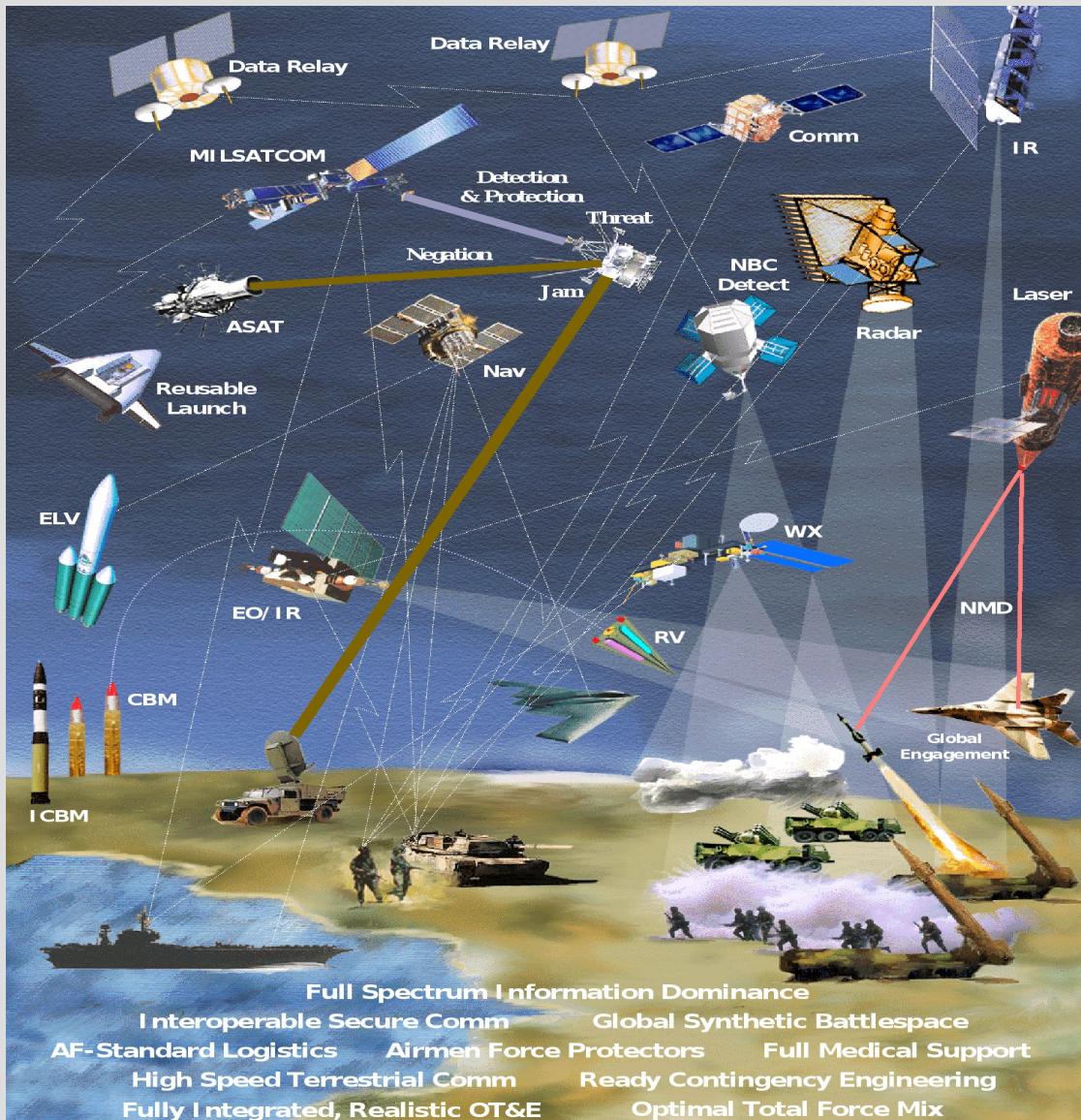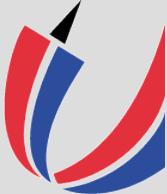
Integrated aerospace operations and training challenges

Three-Phased Approach

- **Phase I (Nearing Completion)**
  - Conduct needs assessment for Space Based Infrared System (SBIRS)
  - Identify shortfalls in readiness training
  - Evaluate alternative solutions
  - Provide data-driven recommendations
  - Develop baseline Knowledge Engineering (KE) tool

- **Phase II (Underway)**
  - Develop protocol to link KE tool and ground control content
  - Demonstrate KE-based instruction approach
  - Develop console training exemplar
  - Assess training impact

- **Phase III (Planned)**
  - KE generalizability to other consoles
  - Expanded KE to address "gaps"
  - Validate and refine training
  - Assess mission impact

General Findings

- **Low-fidelity and non-standardized systems cannot produce "mission ready" operators**

- **No principled instruction for training**

- **Expertise and "best practices" not captured**

- **Displays do not provide real-time data**

- **Limited command and control integration**

- **All crew tasks and members cannot be trained**

- **Emerging systems repeating same mistakes**

- **Significant potential for KE-based instruction in console operations training**

Integrating crew training is mission critical

Task Certification Shortfalls

Legend:
- Equipment Not Available
- Procedures Not Developed
- Software Can Not Support
- Completed Tasks

Categories: CMDR, MCCH, DSO, SCCH, SSO, GSO

Y-axis: 0%, 20%, 40%, 60%, 80%, 100%
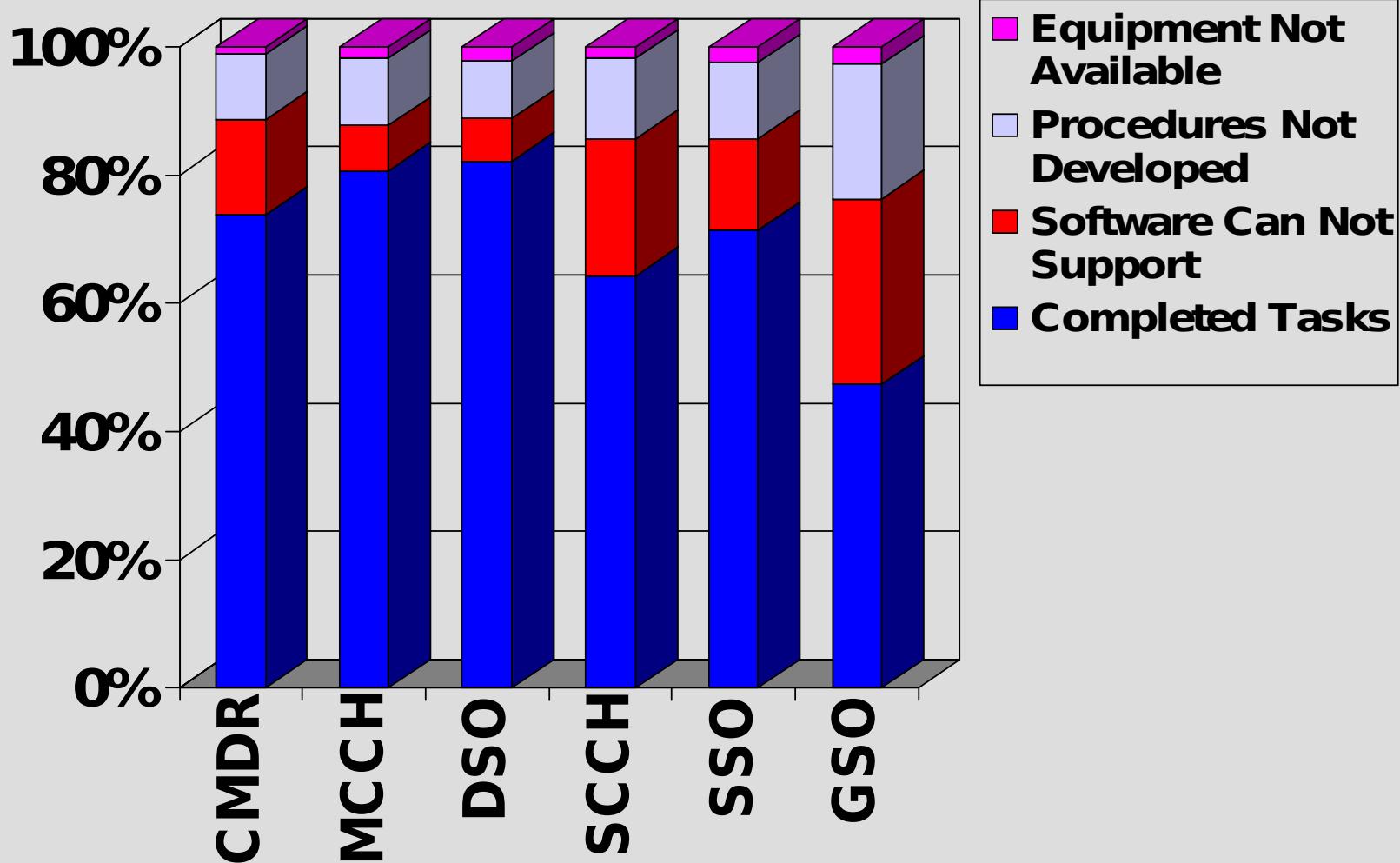
Overall Assessment

Y **Commander Training**

G **Mission Crew Chief/ Data System Operator Training**

R **System Crew Chief Training**

R **Ground System Operator Training**

R

R **Satellite System Operator Training**

Intelligence Situation Analyst

Conclusions

- **Data critical to decision making**

- **Data define shortfalls and fixes**

- **General architecture needed for integrated training**

- **AFRL and AFOTEC collaborating on common MR criteria and metrics**

- **KE tools capture valid models of expertise for instruction**

  - **Assess trainee mastery levels**

  - **Identify additional learning needs**

Summary

- **Leveraging AFRL S&T helped AFSPC save $50M in training costs**

- **AFRL data briefed in funding request to SAF/AQ**

- **Funding decision based on data**

- **Collaborative S&T application very successful**

- **S&T contributions are key to achieving/ maintaining MR crews**

Next Steps

- **Ground control operator KE**

- **Needs assessment summary report**

- **Develop and test of KE-based training**

- **Assess common and unique characteristics of other consoles**

  - **Within SBIRS**

  - **Across similar systems**

- **Develop common console training exemplar**